ELECTRONIC CALCULATOR CALCULADORA ELECTRONICA

CASIO BF-100

OPERATION MANUAL MANUAL DE OPERACION

CASIO.

Thank you very much for purchasing our electronic calculator with 6 built-in financial calculation functions.

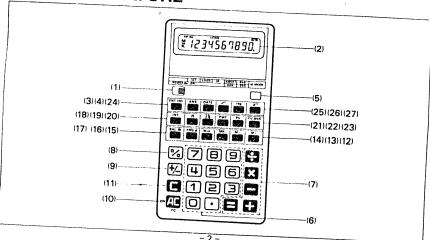
This instruction manual explains the fundamental methods for the use and handling of the calculator. Please read it carefully so that you may fully understand all of the various functions.

Please notify us of any errors or omissions you find in this manual. We cannot be responsible for damage or loss resulting from the information contained herein, use of calculation examples, misprints or omissions.

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1/NOMENCLATURE



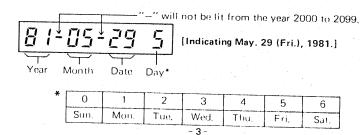
(1) Power switch

Move the slide switch to the right to turn the power ON. The independent memory and mode designation for financial calculation will be retained even after the power is turned OFF.

(2) Display



The display shows input data, intermediate results and results of operation. A date is displayed as follows:



"E" (error check, see page 12) may be displayed in the position of the least digit. In financial calculations, "INT", "LOAN", "SF", "AMORT", "BNS", "ESD" and or "EXD" will be displayed to indicate the operating mode, "ENT/INV" to indicate the condition available for data input, and "ENS" to indicate the condition available for respiratory.

"M" will be displayed when data is stored in the independent memory.

"K" will be displayed during calculation with constants.

(3) Entry/Inverse key

- When entering data, press this key just prior to pressing each key. (Symbolized here as (*))
 When activating the functions printed in grange on the keyboard, press this key just printed.
- When activating the functions printed in orange on the keyboard, press this key just prior to pressing each key. (Symbolized here as m)

(4) Answer key (Symbolized here as 🙉)

For financial calculations, to find the answer, press this key just prior to pressing each key

(5) Mode key (Symbolized here as MOSE)

- Press this key to choose the proper mode for financial calculations (INT, LOAN, SE AMORT, BNS). When this key is pressed, the mode will change in sequence from INT to LOAN to SE to AMORT to BNS to INT. Selected mode will be displayed when the key is pressed.
- If work key is pressed following the workey, Beginning of Period Payment (LOCOL) or End of Period Payment (LOCOL) will be selected and displayed.
- * Any mode may be used when performing basic calculations.

(6) □ -9, • Numeral and decimal point keys

To enter numerals, press these keys.

For decimal places, press the • key in its logical sequence.

(7) 🚨, 🚍, 😝, 🖨 Four basic calculation and equal keys

When performing four basic calculations, press these keys. The ■ key obtains an answer.

* Constant calculations will be performed by pressing each key (♠, ■, ♠ or ♠) twice successively. (See page 13.)

(8) M Percent key

When performing percentage calculations, press this key.

(9) 🔁 Sign change key

When changing the sign of displayed number from plus to minus and vice versa, press this key.

(10) ON FC All clear/Financial calculation clear key

- Press this key to clear all data except independent memory and financial calculating value.
 Also press for display when display is blank as a result of the Auto Power Off Function (Automatic Power Saving Function..... see page 12).
- For financial calculation, prior to beginning to calculate, press me to clear total value memory.

(11) Clear key

When clearing entry for correction, press this key.

(12) Memory plus key (Symbolized here as 1991)

Press this key when adding displayed number to the contents of the independent memory. It has the same function as that of the 🖨 key; it obtains an answer in four basic calculations and automatically add the answer to the contents of the memory.

(13) Memory minus key (Symbolized here as E)

Press this key when subtracting displayed number from the contents of the independent memory. It obtains an answer in four basic calculations and automatically subtracts the answer from the contents of the memory.

(14) Memory recall key (Symbolized here as M)

Press this key when recalling the contents of the independent memory without clearing.

(15) Memory entry key (Symbolized here as 🖦)

Press this key when storing displayed number to the independent memory. Old data held in the memory will be automatically cleared.

Principal/Number of days key

- To calculate the principal portion of an amortized loan, press this key following the 🖼 key. This key will only be used to calculate equal periodic payments in the AMORT mode. (Symbolized here as EN)
- When inputting the number of days from the date of loan to the date of the first payment, press this key following the 📵 key. This key will only be used to perform bonus payment in the BNS mode. (Symbolized here as d) BAL III

Balance/Number of months key

- To find the remaining blance, press this key following the Res key. (Symbolized here as Res)
- When inputting the number of months from the month of loan to the first bonus payment month, press this key following the em key. This key will only be used to perform bonus payment in the BNS mode. (Symbolized here as @)

(18) Interest key

When inputting interest, press this key following 间, To find interest, press following Ms. (Symbolized here as M)

(19) Number of periods key

When inputting number of periods, press this key following m To find number of periods, press following (Symbolized here as (1))

(20) Interest rate key

When inputting interest rate, press this key following m. To find interest rate, press following 屬. (Symbolized here as 图)

(21) Payment key

When inputting monthly payment amount, press this key following III.

To find monthly payment amount, press following w.

When using this key, the number of periods, interest rate, etc. must be on a monthly basis. (Symbolized here as M)

(22) Present value key

When inputting original amount, present value or amount borrowed, press this key following

To find original amount, present value or amount borrowed, press following 🙉 . (Symbolized here as [V])

(23) Future value/Bonus key

• When inputting future value (total future value of principal plus interest), press this key following [19].

To find future value, press following №. (Symbolized here as 🏵) • When inputting bonus payment, press this key following M. This key will only be used to perform bonus payment in the BNS mode. (Symbolized here as ES)

When performing number of days calculation, press this key after inputting numbers for year, month and date. (Symbolized here as MIE)

(25) Square root key

To calculate the square root of displayed number, press this key. (Symbolized here as (7)

(26) Common logarithm key

To find the common logarithm of displayed number, press this key. (Symbolized here as @)

(27) Power raising key

To raise the base x to yth power. (Symbolized here as \mathbb{Z}^3)

2/POINTS OF CAUTION

- * Since the unit contains precise electronic components, never attempt to disassemble it. For servicing contact your retailer or a nearby dealer.
- * Be careful not to drop the unit or handle it roughly.
- Avoid operating the keys roughly. * Avoid using the unit in extreme temperatures (below 32°F or 0°C, or above 104°F or 40°C). Also protect the unit from extremely dusty or humid conditions.
- * To clean the unit, use a soft, dry cloth or slightly damp cloth with neutral detergent to wipe it off. Never use thinner, benzine type solvents or alcohol for cleaning.

3) Replace the battery compartment lid.

- * Before inserting new battery, be sure to thoroughly wipe it off with a dry cloth to maintain good contacts.
- * Never leave dead battery in the battery compartment.
- * Remove battery when not using for an extended period.
- * It is recommended that battery be replaced every 2 years to prevent the chance of malfunctions due to battery leakage.

Note: For initial operation after battery replacement, turn the power switch on and off twice (i.e. ON-OFF-ON).

3/BATTERY MAINTENANCE

When battery power decreases, the whole display darkens. Battery should then be renewed Be sure to switch OFF the power before changing. For battery specifications, see page 57.

Replacement of battery:

- 1) Slide open the battery compartment lid on the back of the unit.
- 2) Remove dead battery and insert new battery with the plus terminal (flat side) on top.

4/BEFORE USING THE CALCULATOR

■ Correction

- * If you are aware of data entry error before pressing a command key, press @ and re-input the correct data.
- * If you have pressed 🕽 , 🖃 , 🗷 or 🚼 by mistake, you may press the correct key immediately.

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Overflow or error check

Overflow or error is indicated by the "E" sign and stops further calculations.

Overflow or error occurs:

- 1) When the integer part of an answer, whether intermediate or final, exceeds 10 digits. However, the significant 10 digits of the answer are given and the decimal point indicates that the true decimal position is 10 digits to the right.
- 2) When the integer part of an accumulated total in the memory exceeds 10 digits.
- 3) When a number is divided by 0 (zero).
- 4) When function calculation or financial calculation is performed with a number exceeding the input range (see page 54 to 56).

To release the overflow or error check, press the 🕮 or 🕞 key: 🙉 for starting a new calculation, and **G** for continuing the calculation, which clears only the "E" sign.

■ Auto power off function

If the calculator is left with the power switch at the ON position, the auto power off function automatically turns off the power in approximately 6 minutes, thus saving battery

Power is resumed either by pressing the 🕮 key or by re-operating the ON-OFF switch.

5/BASIC CALCULATIONS

5-1 Four Basic Calculations

EXAMPLE	OPERATION	READ OUT
53+123-63=113	5301230630	113.

 $0.456 \times (-89) \div 12 = -3.382$ **□456四89四日12日** -3.382

 $(56\times3-89)\div5.2+63$

= 78.19230769..... 560308905020630 78.19230769

5-2 Constant Calculations

EXAMPLE	OPERATION	READ-OUT
3 <u>+2.3</u> =5.3	2⊡3₽₿3₽	к 5.3
6 <u>+2.3</u> =8.3	6 日	к 8.3

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	OPERATION	READ-OUT
EXAMPLE		K 1.4
7 <u>-5.6</u> =1.4	4⊡5⊞目	к -10.1
-4.5 <u>-5.6</u> = -10.1	12002038	к 27.6
$2.3 \times 12 = 27.6$ $(-9) \times 12 = -108$	9₩日	к –108.
	2⊙5日日74日	к 29.6
74 <u>÷2.5</u> =29.6 85.2 <u>÷2.5</u> =34.08	85 □ 2 目	к 34.08
	17000	к 34.
17+17+17+17=68	8	к 51.
	8	к 68.
	107888	к 2.89
$1.7^2 = 2.89$	E	к 4.913
$1.7^3 = 4.913$		к 8.3521
1.74=8.3521	-14 -	***************************************

$\frac{1}{4}$ =0.25	40018 K	0.0625
$\frac{1}{4^2} = 0.0625$		
5-3 Percentage Calculations	OPERATION	READ OUT
12% of 1500	1500 🖬 12 🛭	180.
Percentage of 660 against 880 75%	660#880%	75.
15% add-on of 2500	2500日159日	2875.
25% discount of 3500	3500월25월章	2625.
If you made \$80 last week and \$100 this week, what is the percent increase?	100 🗖 80 🖾	25. (%
week, what is the parton and	15 -	

EXAMPLE	OPERATION	READ-OUT
12% of 1200	1200日日12四	к 144.
18% of 1200	18%	к 216.
23% of 1200	23%	к 276.
Mark-up	480 🖬 25 🖾	640.
What will the selling price and profit be	, ,	(Selling price)
when the purchasing price of an item \$480 and the profit rate to the selling price is	(Subsequently)	160.
25%?		(Profit)
Mark-down	130 🗗 4 🖾 %	125.
What will the bargain price and loss be if a \$130 item is sold at a loss rate of 4% of the bargain price?	,00	(Bargain price)
	(Subsequently)	-5.
the borgen person	, , ,	(Loss)

- 5-4 Memory Calculations
 The contents of the memory will be retained even after the power is turned OFF.
 When a new number is entered into the memory by key, the previous number stored is automatically cleared and the new number is put in the memory.
 To clear the contents, press ke in sequence.

EXAMPLE	OPERATION	R	EAD-OUT
53+6= 59	53 868	И	59.
23-8= 15		м	15.
56×2=112	56四2	м	112.
+) 99÷4= 24.75	99 ₽ 4₩	м	24.75
210.75	MR	М	210.75
7+7-7+(2×3)+(2×3)+(2×	$3)-(2\times3)=19$		
/+/-/+(Z×3/+(Z×3/+\Z×		м	19.

EXAMPLE	OPERATION	HEA	4D-001
12×3= 36	3 22 12 2	M K	36.
–) 45 <u>×3</u> =135	45 №	M K	135.
78 <u>×3</u> =234	78M+	M K	234.
135	MR	M K	135.
0.0.0	7 日 2日8日 🚾	М	40.
$\frac{9\times 6+3}{8\times (7-2)}=1.425$		м	1.425
$\frac{8\times(7-2)}{8\times(7-2)}$ = 1.425	9 26 35 8	М	1.4

5-5 Date Calculations

Input for date calculation is limited to January 1, 1901 through December 31, 2099.
Date calculations are computed by using only the last 2 digits of the year, when the calendar range is 1901 to 1999. Enter full four digits for years, 2000 to 2099.

EXAMPLE	OPERATION	READ-OUT
What will the day of the week be on Jan. 1, 1982?	82 🕮 🗎	82-01-01 5
		(Friday)*
	* See pag	ge 3 on day of the week.
What will the day of the week be on Mar. 1, 1990?	90 MI 3 🖪	90-03-01 4
		(Thu.)
* When pressing 🖨 , 🖨 , 🖨 , or 🖨 date of the year (or month) will be d		year & month), the first
What will the day of the week be on Dec. 31, 2001?	2001 DATE 12 DATE 31 DATE	01 12 31 1
		(Mon.)
How many days are there from Oct. 20 to Dec. 13, 1981?	81 DATE 12 DATE 13 🗖	81-12-13 0
	81 ME 10 ME 20 E	54.
	- 19 -	

OPERATION	READ-OUT
81 DATE 7 DATE 7	81-07-07 2
200目	82-01-23 6
81 DATE 6 DATE 10	81-06-10 3
45 日	81-04-26 0
82 DATE 4 DATE 7 D D	к 82-04-07 3
50 日	к 82-05-27 4
100日	к 82-07-16 5
150目	к 82-09-04 6
	81 ME 7 ME 7 M 200 B 81 ME 6 ME 10 M 45 D 82 ME 4 ME 7 M D 50 B 100 B

⁵⁻⁶ Function Calculations ($\sqrt{}$, log, x^y) EXAMPLE OPERATION READ-OUT $\sqrt{5}$ = 2.236067977 5 🗹 2.236067977 $\sqrt[4]{81} = 3$ 8100 $(\sqrt{2} + \sqrt{3}) \times 3 = 9.43879311$ 20030038 9.43879311 $\log 1.23 (= \log_{10} 1.23) = 0.089905111$ 1 🖸 23 🞯 0.089905111 (log147+log52)×4=15.53328272 147◘52◘4目 15.53328272 101.23=16.98243652 10271 1 23 日 16.98243652 (Obtain the antilogarithm of log 1.23.)

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* A date can be stored into the memory.

EN ANADI E	OPERATION	READ-OUT
5.6 ^{2.3} =52.58143837	5⊡6☑2⊡3 ⊟	52.58143837
4 ^{2.5} =32	205₽₽4日	к 32.
	⊡ 16 ⊟	к 0.01024
$0.16^{2.5}_{-}=0.01024$ $9^{2.5}_{-}=243$	9 ⊟	к 243.
(78-23)-3=0.0000060	78日23回3四日	0.00006011
2×3.4 ^(5+6.7) =3306232	5日6⊙7日№3⊙4ば№日2日	м 3306232.

6/FINANCIAL CALCULATIONS

- Press the woll key and set the mode which corresponds to the type of desired financial
- When you start to calculate, press 🔞 📅 to clear the memory for financial calculation. (will not clear the memory)
- When making inputs with each key, press the (19) key after putting in the numbers then press each key. Also, to find the calculated result, press each key after the 🙉 key.
- Contents of input data can be checked by directly pressing each key.
- Input interest rate by 🗷 key as a percentage rate.
- Input number of periods and interest rate should correspond. If number of periods is in years, interest rate should be the yearly interest rate. If number of periods is in months, interest rate should be the monthly interest rate. If number of periods is in days, interest rate should be the daily interest rate.

Notes: a) It may take a long time to calculate the interest rate. In this case, to stop the calculation while in progress, keep pressing the key until the display goes to 0.

b) If the result of the calculation is too great a number, an error display ("E") will appear. This can be cleared by pressing G or C . However, the financial calculation memory will retain the stored value.

6-1 Compound Interest Calculations

• Compound interest calculation is performed in the INT mode (press mode key until "INT"

■ Financial keys used for compound interest calculation are M , M , M , M and W .

• Each data element can be calculated as follows:

 $FV = PV (1 + i)^n$ Total amount of principal and interest

Principal
$$PV = FV (1+i)^{-n} = \frac{FV}{(1+i)^n}$$

Number of periods
$$n = \frac{\log(\frac{FV}{PV})}{\log(1+I)}$$

Interest rate
$$i\% = \left\{ \left(\frac{\text{FV}}{\text{PV}} \right)^{1/n} - 1 \right\} \times 100$$

Interest
$$I = PV (1+i)^n - PV$$

1. Total amount of principal and interest

Example 1 - What is the total amount of principal and interest on a \$5,000 principal at 6% annual interest compounded annually over a period of 7 years?

	OPERATION	READ-OUT
Press Moot key until "INT" is displayed. (sam	e for below)	
"INT"	INV FC	0.
(number of years)	7 M / 1	7.
(annual interest)	6MB	6.
(principal)	5000₪₪	5000.
(total amount of principal and interest)	ANS FV	7518.151295
(total amount of principal and interest)		

* Data may be input in any sequence. (same for below)

Example 2 — Recalculate Example 1 for semiannual compounding of interest.

	OPERATION	READ-OUT
"INT"	INV FC	0.
	7 22 1111	14.
	6 22 2	3.
	5000 M PV	5000.
	ANS FV	7562.948624

2. Compound interest initial deposit

Example – How much principal must be initially deposited to accumulate \$10,000 at the end of 2 years if the annual interest rate is 4% and principal and interest are compounded every 3 months?

	OPERATION	READ-OUT
"INT"		
	INV FE	0.
(period)	22481111	8.
(interest rate)	48480012	1.
(total amount of principal and interest)	10000 ₪፻፶	10000.
(initial deposit)	ANS PV	9234.832225

3. Compound interest investment

Example – What is the interest rate required to receive a return of \$7,000 on a \$4,000 investment if the money is invested for 10 years and principal and interest are compounded annually?

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	OPERATION	READ-OUT
"INT"	INV #	0.
(period)	10 🕅 🗇	10.
(principal)	4000 MPV	4000.
(total amount of principal and interest)	7000 m 🗹	7000.
(interest rate)	ANS (%)	5.755705034

4. Compound interest period

Example – How many years will it take to reach \$10,000 if you deposit \$500 at 5.4% annual interest compounded monthly?

	OPERATION	READ-OUT
"INT"	my Fe	0.
(monthly rate)	5 • 4 € 12 ⊟ M 🔀	0.45
(principal)	500 me	500.
(total amount of principal and interest)	10000 m EV	10000.
(period number of months)	ANS (7)	667.215
(number of years)	6 12 6	55.60125

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5. Interest calculation

Example — What is the amount of interest after two years if you invest \$5,000 at 5% annual interest and interest is compounded every 3 months.

"INT"	OPERATION READ-OUT
(period) (interest rate) (principal) (interest)	

6. Conversion from nominal interest rate to effective interest rate

Example — What is the effective interest rate for a nominal interest rate of 12% annual interest compounded every 3 months?

"INT"	OPERATION	READ-OUT
(period)	INV C	0.
(nominal interest rate)	4 (NT /n	4.
(assumed principal)	12848 M 🔀	3.
(effective interest rate)	100 med	100.
7. Conversion from effective interest ra	ANS INT	12.55088099

7. Conversion from effective interest rate to nominal interest rate Example – What is the nominal interest rate for an effective interest rate of 12.55%

? an enective	interest rate of 12.55%.
OPERATION	READ-OUT
INV CO	0.
	4.
	100.
	112.55
	2.999798439
- 29 - □ 4 □	11.99919376
	OPERATION

6-2 Loan Calculations

- Loan calculation is performed using the LOAN mode (Press the Mode key until LOAN is displayed.)
- Loan calculation can be performed using either end of period payments or beginning of period payments. Press w and wo to select 'and 'r 'and'.
- Each data element can be obtained by the following formulas:

End of period payment

PV = PMT
$$\cdot \frac{1 - (1 + i)^{-n}}{i}$$
 = PMT $\cdot \frac{(1 + i)^n - 1}{i \cdot (1 + i)^n}$

PMT = PV
$$\cdot \frac{i}{1 - (1+i)^{-n}} = PV \cdot \frac{i \cdot (1+i)^n}{(1+i)^n - 1}$$

$$n = \frac{\log (1 - i \cdot \frac{PV}{PMT})}{\log (1 + i)}$$

Beginning of period payment

$$PV = PMT \cdot (1+i) \cdot \frac{1 - (1+i)^{-n}}{i}$$

PMT =
$$\frac{PV}{1+i} \cdot \frac{i}{1-(1+i)^{-n}} = \frac{PV}{(1+i)} \cdot \frac{i \cdot (1+i)^n}{(1+i)^n - 1}$$

$$n = \frac{\log \left(1 - \frac{i}{1+i} \cdot \frac{PV}{PMT}\right)}{\log \left(1+i\right)}$$

1. Borrowing money

Example – How much can be borrowed if you have a \$450 per month payback capability and the annual interest rate is 7.5% and the payback period is 15 years?

	OPERATION	READ-OUT
"LOAN, ব্রেম্ম " end of payment peri Press জ and জ্জো to display "ব্রুম্ম " (same	od (same for below) for below)	
(payment)	INV FC	0.
(interest rate)	450 1	450.
(period)	7⊙5 日 12 日 丽徽	0.625
(amount that can be borrowed)	15012007	180.
•	ans PV	48543.04208
"LOAN, GEN " beginning of paymer	nt period (same for below)	
Compount that are all a	INV MOOE	48543.04208
(amount that can be borrowed)	ANS PV	48846.43609

2. Payback

Example — What will be the monthly payment on a loan of \$2,000 borrowed for 24 months at a 6% annual interest rate with interest compounded monthly?

	tompounded monthly?	13
"LOAN, END"	OPERATION READ-OUT	
(period) (interest rate) (amount borrowed) (monthly payment) "LOAN, EEN"	24 MT/2 24. 6 12 12 18 12 0.5 2000 MPV 2000. 48 MT 88.64122051	
(monthly payment)	(NV) MODE 88.64122051 (ANS) PMI 88.20021941	

^{* &}quot; END " or " EGN " can be selected at any time without affecting the calculation function. - 32 -

3. Loan payment period

Example – How long will it take to pay back a loan of \$30,000 borrowed at a 5.5% annual interest rate by making a monthly payment of \$420?

	OPERATION	READ-OUT
"LOAN, EXD "		
	RV FC	0.
(amount borrowed)	30000 🎟 🖭	30000.
(monthly payment)	420 🕅 🎮	420.
(interest rate)	5⊡5812日∞3	0.458333333
(period , number of months)	MS n	86.72384
(period number of years)	9 12 9	7.226986667
"LOAN, EEN "	·	
	(INV) (MODE)	7.226986667
(period number of months)	ANS TI	86.23877
(period , number of years)	1 12 1	7.186564167

4. Effective interest rate

Example — What is the annual interest rate for a \$50,000 loan when paid back at \$640 per month over a period of 25 years?

	OPERATION	DEAD OUT
"LOAN, END "	5.5(0,110)	READ-OUT
	INV FC	0.
(period)	25 2 12 3 12	300.
(monthly payment)	640 m em	640.
(amount borrowed)	50000 MPV	50000.
(interest rate, monthly)	ANS (%	1.249107827
(interest rate annual)	□ 12 □	14.98929392
"LOAN, EED"		
(interest cata	INV MODE	14.98929392
(interest rate monthly)	ANS [2	1.266498816
(interest rate annual)	G 12 G	15.19798579

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6-3 Annual Payments

- Annual payment is performed by inputting amount borrowed (™), number of periods (™), and interest rate ((3)), and by calculating monthly payment ((11)) in the "LOAN" mode. Interest portion (and principal portion (and) of a monthly amortized loan, and remaining balance (M) are calculated in the "AMORT" mode. (Press the mode key until "AMORT" is displayed.)
- Either input or output of [2], [1] and [2] can be accomplished. However, [4], [2] and [4] must be determined by calculating.
- Monthly III, III and III can be determined by using the following formulas.

$$INT_n = BAL_{n-1} \cdot i$$
 $PRN_n = PN$

$$PRN_n = PMT - INT_n$$

$$BAL_n = BAL_{n-1} - PRN_n$$

Example — What is the monthly payment on a loan of \$40,000 borrowed for the purpose of buying a house at a 10% annual interest rate for 15 years? Also, find the 🖃, 🙉 and (a) for the 1st and 2nd monthly payments.

/// CAN	OPERATION	READ-OUT
"LOAN, END"	INV FC	0.
(amount borrowed)	40000 MIPV	40000.
(period)	15 2 12 3 12	180.
(interest rate)	106128 @ 🗷	0.833333333
(monthly payment)	ANS PMT	429.842047
	- 36 -	

"AMORT"

(continuing)		
(1st month)	MODE MODE	429.842047
(payment to interest)	1 M n	1
(payment to principal)	ANS INT	333.33333332
(remaining balance)	AKS PRM	96.5087138
3 1 1 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AMS BAL	39903.49129
(2nd month)		1.0123

2 (M) m	
	2.
ANS INT	332.5290939
ANS PRN	97.3129531
ANS BAL	39806.17833

* By repeating this operation, an amortization schedule of each month's payment to interest, payment to principal and remaining balance can be made.

AMORTIZATION SCHEDULE

\$40,000
10%
15 years

			rayment period	15 years
Number of payment	Payment to principal	Payment to interest	Total payment	Remaining principal balance
1	96.5087138	333.3333332	429.842047	39903.49129
2	97.3129531	332.5290939	429.842047	39806.17833
3	98.12389437	331.7181526	429.842047	39708.05444
4	98.94159349	330.9004535	429.842047	39609.11284
5	99.76610677	330.0759402	429.842047	39509.34674
	• :	:		•
175	408.9631245	20.8789225	429.842047	2096.50759
176	412.3711506	17.4708964	429.842047	1684.13643
177	415.8075768	14.0344702	429.842047	1268.32885
178	419.2726399	10.5694071	429.842047	849.05622
179	422.7665786	7.0754684	429.842047	426.28963
180	426.2896334	3.5524136	429.842047	0.
		I.		ı

6-4 Bonus Payments

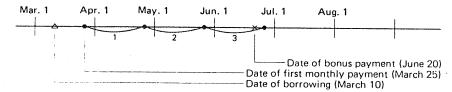
- Bonus payment calculation is performed in the "BNS" mode (press mode key until "BNS" is
- Data required are interest rate (涵), number of months (徊), amount borrowed (☒), number of days from the date of the borrowing to the 1st payment date (), amount of bonus payment (🖼), number of monthly payments made before 1st bonus payment is made (m)* (see the note below indicated by*). Output is monthly payment amount () only.
- Number of months (m) and number of days (a) must be 1 or 2 digit integers ($n \ge m$).
- Monthly payment is calculated using the following formula.

PMT =
$$\frac{i \cdot (1+i)^n}{(1+i)!(1+i)^n - 1!} \cdot \{ \text{PV} \cdot (1 + \frac{d}{30} \cdot i) - (1+i)^6 \cdot \frac{\text{BNS}}{(1+i)^m} \cdot \frac{(1+i)^6 \ell_{-1}}{(1+i)^6 - 1!(1+i)^6 \ell} \}$$

 $\ell = \text{INTEGER} \left(\frac{n-m}{6} \right) + 1$

* In counting the number of months before the first bonus payment, start from the date of the first monthly payment.

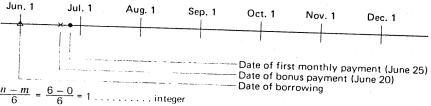
Example – If you borrow on March 10, and make monthly payment on every 25th, and first bonus payment on June 20:



For the period between March 25 and April 24, m=1; for the period between April 25 and May 24, m=2; for the period between May 25 and June 24, m=3.

In the formula to calculate ℓ , the number of bonus payments, if $\frac{n-m}{6}$ is an integer (0, 1, 2, ...), the next bonus payment is included in the calculation.

Example — If the first bonus payment is earlier than the first monthly payment, and you are paying back in six months:



This makes ℓ , the number of bonus payments, two.

- * You may want to reduce the number of bonus payments by one when $\frac{n-m}{6}$ is an integer. Or you may want to input 0 (zero) for m. If so, input m+1 for m, and BNS (1+i) for BNS.
- Example What is the monthly payment when \$40,000 is borrowed on March 10, annual interest rate is 6.7%, repayment period is 10 years and a bonus payment of \$1,000 is to be paid twice a year?

 Assume that: 1) each monthly payment is made on the 25th of the month; and 2) the first bonus payment is made on June 20.

OPERATION	READ-OUT
more [0.
40000 EMEV	40000.
6⊡7日12日∞∞	0.558333333
10日12日剛但	120.
1000 [81] [813]	1000.
3 111 11	3.
15 🖼 🗷	15.
ans part	290.8048549
	40000 MPV 6 7 2 12 2 MPX 10 2 12 2 MPX 1000 MBM 3 MPX 15 Md

6-5 Installment Savings

- Installment savings is calculated in the "SF" mode. (Press the @ key until "SF" is displayed) However, if an initial deposit is made, use "INT" mode to input the number of periods and the interest rate.
- Installments can be calculated when paid at the beginning of the period or at the end of the period by pressing

 to display "ESIN".

• Each data element is obtained using the following formulas.

Beginning of period payment

Total amount of principal and interest

$$FV = PMT \cdot (1+i) \cdot \frac{(1+i)^n - 1}{i}$$

Deposit amount

$$PMT = \frac{FV}{(1+i)} \cdot \frac{i}{(1+i)^n - 1}$$

Period

$$n = \frac{\log \left(\frac{i}{1+i} \cdot \frac{\text{FV}}{\text{PMT}} + 1\right)}{\log \left(1+i\right)}$$

Interest rate

Approximation formulas by Newton's Law

End of period payment

Total amount of principal and interest

$$FV = PMT \cdot \frac{(1+i)^n - 1}{i}$$

Deposit amount

$$PMT = FV \cdot \frac{i}{(1+i)^n - 1}$$

Period

$$n = \frac{\log (i \cdot \frac{\text{FV}}{\text{PMT}} + 1)}{\log (1 + i)}$$

Interest rate

Approximation formulas by Newton's Law -43-

1. Installment savings total amount of principal and interest

Example — What is the total amount of principal and interest when deposits are \$100 per month, annual interest rate is 6% and number of years is 5 years with interest

"SF, EIGN "	OPERATION	READ-OUT
(period) (interest rate) (deposit amount) (total amount of principal and interest) "SF, EXD"	MY FE 5 12 12 11 17 6 12 12 11 12 100 11 11 11 11 12 11 11 11 11 11 11 11 11 11 11 11 1	0. 60. 0.5 100. 7011.888066
total amount of principal and interest)	(INV) (MODE) (ANS) (FV)	7011.888066 6977.003051

2. Installment savings monthly deposit

Example — What is the installment savings monthly deposit required to accumulate a savings of \$5,000 over a 10 year period when the annual interest rate is 6% and is compounded monthly?

	and is
"SF, छन्त्रा "	OPERATION READ-OUT
(period) (interest rate) (total amount of principal and interest) (monthly deposit) "SF, END"	10 12 12 12 12 12 12 12 12 12 12 12 12 12
(monthly deposit)	(MS) (MS) (MS) (MS) (MS) (MS) (MS) (MS)

3. Installment savings number of deposits

Example – What are the number of monthly deposits required to accumulate \$10,000 in savings by depositing \$200 per month at an annual interest rate of 6% compounded monthly?

OPERATION	READ-OUT
INV FC	0.
6 8 12 8 ®	0.5
200 🖩 🕅	200.
10000 🞟 🖾	10000.
aks n	44.54059
⊞ 12 ⊟	3.711715833
(INV MODE	3.711715833
ans n	44.74019
B 12 B	3.728349167
	10000 MFV MS/7

4. Installment savings interest

Example — What is the interest rate required to accumulate a total amount of principal and interest of \$8,000 by making monthly deposits of \$50 per month for a period of 10 years?

	OPERATION	READ-OUT
"SF, EEN "	INY FC	0.
(period)	10日12日剛四	120.
(monthly deposit)	50 🞟 🌆	50.
(total amount of principal and interest)	8000 ME	8000.
(interest rate monthly)	ANS (28)	0.456062825
(interest rate annual)	12 12 2	5.4727539
"SF, END"	·	
	GOOM (VAI)	5.4727539
(interest rate monthly)	ANS (2)	0.46309817
(interest rate annual)	112	5.55717804
	47	

5. Installment savings (when an initial deposit is made)

Example — What is the total amount of savings at the end of 1 year when an initial deposit is made and then monthly deposits of \$250 are made at the end of each month at a 4.5% annual interest rate compounded monthly?

	OPERATION	READ-OUT
"INT"	INV AS	0.
(period)	12 M	12.
(interest rate)	4⊡5 ⊞ 12 ⊟ ™⅓	0.375
(initial deposit)	500 M PV	500.
(total amount of principal-and interest)	ANS FV Min	^M 522.9699125
"SF, ⊑XD " *		
	MODE (MODE	^M 522.9699125
(monthly deposit)	250 ₪ 🎮	^M 250.
	n	^M 12.
	[2]	м 0.375

(total amount of principal and interest) (grand total)

™ 3062.655002 ™ 3585.624915

* For end of month deposits, use end of period " END " function.

· 6-6 Deferred annuity present values

- Future value (例), deferral period (例) and interest rate (图) are input using the "INT" mode. Payment (例) and payment period input as well as present value calculation are performed using the "LOAN" mode.
- Deferred annuity present value can be calculated using either beginning of period payments or end of period payments by pressing [will word to display "gas" or "gas".

Example — What is the present value of a 2 year deferral future value that will provide an income of \$300 per year for a period of 8 years after 2 years at an annual interest rate of 7% compounded annually?

	OPERATION	READ-OUT
"INT"		
	INV #5	0.
(future value)	300 EM EV	300.
(deferral period)	2 m n	2.
(interest rate)	7 m (%)	7.
(present value)	ANS PV	262.0316185
"LOAN, END"		
2071,4, 222	MODE	262.0316185
•	ENT PMT	262.0316185
(payment period)	8 MI n	8.
(present value)	ANS PV	1564.669012
"LOAN, EEN"		
LOAN, ESS	INV MODE	1564.669012
(present value)	ANS PV	1674.195843
	- 50 -	

7/APPLICATIONS

Example 1 — Invoice Calculation

Nomen- clature	Items per box	Number of boxes	Price per item	Total price
A B C	12 50 	7 6 25	\$450 75 580	\$37,800 22,500 14,500
	Total			74,800
	3% sales tax			2,244
	Transportation charge			1,350
	Total invoice amount			\$78,394

OPERATION	READ-OUT	
12 070 450 0	м	37800.
50월6월75₩	М	22500.
25월 580₩	М	14500.
MR	М	74800.
₩ 3 % ₩ +	М	2244.
1350₩	М	1350.
MR	М	78394.

Example 2 - Pro-rating

Class	Sales	Percentage of total
A B C	\$ 84 153 138	22.4 % 40.8 🕽 🕻 🗒 36.8 🙀 🗀
Total	\$375	100,0 %

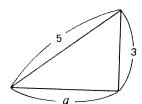
OPERATION	READ-OUT		
84日153日138日		375.	
# 100 B B	K	3.75	
848	M	22.4	
153 ⊞	M	40.8	
138⊞	×	36.8	
MR	M	100.	

Example 3 — Proportional Distribution Calculation

	Class	Proportional distribution	Price
À	A B C D	28 37 46 90	\$ 1,820 2,405 2,990 5,850
-	Total	201	\$13,065

OPERATION		READ-OUT	
28 237 246 290 2		201.	
BB 13065 BB B 28 B B	M K	1820.	
37 ₩+	M	2405.	
46 M+	M K	2990.	
901	M K	5850.	
MR	MK	13065.	

Example 4 - Pythagorean Theorem



$$a = \sqrt{5^2 - 3^2} = 4$$

OPERATION	READ-OUT
5 # 6 mg / m	M 25. M 9. M 4.

Example 5 — Find the monthly payment and mark up for a loan of \$10,000 with 24 equal payments and an annual interest rate of 17.5%. However, monthly payment is in dollar units and the total fractional payments are added to the first

"LOAN, END"	OPERATION	READ-OUT
	₩₩₩ 24 MI/I	24.
	1705 6 128	1.458333333
	10000 me	10000.
For this answer, the monthly payme Also, the 1st payment will be:	nt will be \$496.	496.8284792
(continuing)	■496⊠24₩496₽	515.8835008
Mark up : (continuing)		
3 ,	Mary	[™] 515.8835008
	496☎23⊞	^M 11408.
	10000 ₪	^M 10000.
	MR	M 1923.8835
	- 55 -	

- 54 -

■ Financial Calculation Unit Capacity

Key	Mode	INT	LOAN	SF	AMORT	BNS
	Imput Catent range	0 ≤ x < 10 ³	0 5 3 - 10 5	0 5 X + 10 ⁴	$0 \le \chi < 10^4$	0 S. Y - 10 1
n	Агенчегу	7th digit * 1		(1% > 10 ⁻³)		-
	Input d'alput range	-100 < x < 10 ¹⁰	100 < x < 10 ¹⁰	$-100 < x < 10^{10}$	1(81 × χ < 10 ¹⁰	- 100 ≤ 3′ ≤ 10 ¹⁰
1 %	Accurat y	7th digit 41	4th digit + 1 (When N = 6 to 360 and 75 = 0,52 to 1,48 6th digit + 1	Ath digit ≥ 1 (When	-	-
	Input Output range		0 ≤ x < 10 ¹⁰	0 & v < 10 ⁴⁰	0 \$ x < 10 la	0 S. X < 10 H9
PMT	Acrosmy		1000 digit +1 (D 2 1, P ≥ 10 ° 1) [Wown 10 ° + P × + 10 ° 1 [Wown 10 ° + P × + 10 ° 1 [Wown 10 ° + P × + 10 ° 1 [Wown 10 ° + P × + 10 ° 10 digit +1]			9th dags +1 (FS ≥ 10 ⁻³) [Moon 10 ⁻³ + FS, +10 ⁻⁹] [9th to 8th dags +1,
	Input/Output range	0 % x < 10 ¹⁰	0 % x < 10 ⁸⁰		t) ≤ χ < 10 ¹⁰	0 < x < 10 m
₽V	Acostae y	10th digit ±1 (When f's < 10 ⁻⁸) 7th digit ±1	106 digit ±1 20 ≠ 1, 15 ≠ 10 ⁻³ ; When 10 ⁻¹ > 18, >10 ⁻⁹ ; 66, to 966 digit ±1, 35, to 96 digit ±1.	-	_	
1			- 5	8 –		

Key	Mode	INT	LOAN	SF	AMORT	BNS
	Input/Output range	0 & x < 10 ¹⁰		05 Y + 10 ¹⁰	0 × y - 10 PF	
FV	Асситасу	Hitti digit + 1 (When pt + 10 * Titi digit + 1		Trending of Research Machine Street Control of the Street Control	-	
BNS	Input/Output range	-	-			0.5.2.< 10 ¹⁰
(6,19)	Accuracy			The state of the s		-
(NT)	Input/Output range	0 ≤ x < 10 ¹⁰	-		0 \$ x < 10 10	-
اس	Accuracy	**			Bith digit + 1	-
BAL	Input/Output range	"		-	0 s.x × 10 l0	-
	Ассиласу				Billi digit + 1	
m	Imput/Chilput sange					#1 5 x < 10'
	Accuracy	-		-		-
PRN	Input/Output range	-		-	11's x - 10 ¹⁰	
	Διτ.μ.κ.γ				Rational - I	
a	Input/Output carge	-				#1 % r < 10'
العا	Accora,					

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8/SPECIFICATIONS

Type: BF-100

Basic calculations:

Addition, subtraction, multiplication, division, constants for $\pm -/x/$, percentage calculation, memory calculation and date calculation.

Function calculations:

Square root, logarithm and power.

- 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	The way the second in the second	\$ 3m
• Function calculation capacity		: 13
The state of the s	utput accuracy	100
Input range	THE REPORT OF THE PROPERTY OF	6.7
14-1/7-3	10th digit ±1 學	
Y > 0	تا بي المحاصر و و مساور الماس	12.
When $x < 0$, $y \Rightarrow Natural number \downarrow $		
	Charles and Control	
When the answer is more than 1010, accuracy is 9th digit ±1,	11	14.5
A Company of the Comp	Substitute (Sugarity)	

Financial calculations:

Compound interest calculation, loan calculation, annual payment, bonus payment, installment saving and deferred annuity present value.

Capacity:

r Display:

d. Liquid crystal display

Overflow or error check:

Indicated by the "E" sign, locking the calculator.

and the section of the second

Main component:

One chip LSI

Power consumption:

0.00043W

Uı

Power source:

One lithium battery (type: CR2025).

The calculator gives approximately 1,300 hours on type CR2025.

Ambient temperature range:

 $0^{\circ}C - 40^{\circ}C (32^{\circ}F - 104^{\circ}F)$

Dimensions:

8.7H x 71.5W x 134mmD (3/8"H x 2-7/8"W x 5-1/4"D)

Weight:

60g (2.1 oz) including battery.

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